

Australian Parachute Federation Incorporated



DISPLAY JUMPER'S HANDBOOK

A Guide for Parachute Display Jumpers

STATUS: ADVISORY

V2-122009

DISPLAY JUMPER'S HANDBOOK

IMPORTANT - READ THIS INFORMATION

This is not a do-it-yourself manual. Parachuting is dangerous. You should seek expert guidance before carrying out any of the procedures described here and should ascertain that your proposed actions are consistent with your experience and competence, your equipment and local rules and conditions.

This manual has been produced for the information of APF members. The information it contains is based on the opinions of the writer: it does not represent APF policy. While the writer has attempted to ensure that the information in this manual is correct, it may contain information which is out of date or incorrect.

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First issued July 1988
Revised September 1994
 January 2001
 December 2009

FOREWORD

Have you ever heard any of those old stories about display jumps gone wrong? Perhaps it was the one about the jumper who used a brick tied to a pilot chute for a drifter. The "drifter" landed through the windscreen of a car on a major city freeway. How about the night jumper who was carrying a banner and a night flare - the banner caught alight and nearly turned the jumper into a blazing human torch.

My own experiences with displays gone wrong include, among others, a jump into the Commonwealth Games venue. Our "three stack" was sucked into a storm cell and dragged up to about 12000ft. I subsequently landed about 10km off target.

All these stories make good bar time entertainment. However that's all they are. In most instances a display gone wrong can seriously endanger jumpers, personal property, pilots and in the worst cases the spectators. Happily display jumpers have learnt a lot over the years, mostly from hard won experiences like the ones I have mentioned. This learning, however, can create gaps between the seasoned display jumpers and the newcomers. Sometimes these lessons are not passed onto others, be it for commercial reasons or simply a lack of a suitable systems for passing on the information.

This then is the purpose of this brief handbook. It is an attempt to bridge the gap between the experienced and not so experienced display jumpers. It has been compiled from articles and ideas from some of the top display jumpers from Australia and overseas. It is not so much a "how to do it" guide, more a "how some others do it" collection of hints.

If you have suggestions for improving this handbook, please advise the APF office. The address is P.O. Box 1440 Springwood Qld 4127.

This handbook is written for the jumper participating in a display; it does not cover the details of display organisation, which is covered by the APF Display Manual. Only holders of a Display Organiser's Licence may take responsibility for organising a display. Information about the requirements for this licence may be found in the Operational Regulations.

This handbook, I believe, contains some important information and should be read carefully by anyone intending to become involved in display jumping. There is undoubtedly a lot to be gained from the experiences of others and there can also be a lot at stake. Display jumps present our sport to the public. It is up to all of us to ensure we do it well.

Rick Collins
APF National Coach
July 1988

INTRODUCTION

Display parachuting presents our sport to the general public who will judge us on what they see. It should be a professionally presented form of entertainment.

All display organisers and jumpers who accept the responsibility for doing parachute displays must take into account the risks and possible consequences of displays that misfire. Sound judgement should never be influenced by the desire not to disappoint the organiser or the public. Injuries sustained in public and parachutists landing outside the target area have an adverse effect on public opinion of the parachutists and the sport in general as these instances usually result from incompetence or jumping in unsuitable conditions.

Display parachuting calls for the highest standards of planning, co-ordination, experience, mutual confidence, safety consciousness and parachuting skill. For these reasons parachutists who cannot be relied upon to do what is expected of them should not be permitted to take part in displays.

Previously, the conduct of parachute displays was controlled by the Civil Aviation Authority. A person wishing to organise a display was required to write to CAA at least three weeks ahead, giving full details and seeking permission to carry out the display.

The APF considered that these procedures were cumbersome, difficult to comply with and often failed to ensure the professionalism of displays. The Federation was able, first, to negotiate some concessions for the most experienced display organisers, then in 1992 persuaded CAA to relinquish its control of display parachuting to the APF.

At that time, a Display Organiser's Licence was instituted, and all responsibility for the organisation of a parachute display passed directly to the Licensed Display Organiser (LDO). The LDO is responsible for all aspects of the organisation, including approval of the landing area, selection and briefing of jumpers and ground crew, liaison with Air Traffic Control, reporting of incidents, etc.

While the Licensed Display Organiser is responsible for the organisation of the display, including the selection of the display jumpers, it is the individual jumpers' responsibility to ensure that they perform competently and professionally. The information in this handbook is designed to help you to this end.

HINTS FOR DISPLAY JUMPERS

Before the Display

On agreeing to jump in a parachuting display, the jumper accepts certain obligations.

Personal Equipment

Display jumpers should ensure that their personal parachute equipment is in good condition, ready to jump, and suitable for the particular event. The following points are pertinent: It is not acceptable to jump a canopy with an advertising logo on a display sponsored by some other advertiser, except with the sponsor's permission.

You must use a suitable main canopy. High performance main canopies are not always appropriate when you must land in a tight area.

High performance canopies require a long "runway". Landing in the crowd is not on, and is a sure way of not being asked to participate in future displays. If you can't guarantee that the landing area will be long enough, think about using a seven cell canopy.

Likewise, if the landing area is surrounded by tall trees or buildings, you may have to sink your canopy into the landing area. Many modern canopies cannot be flown in a sink mode. Breaking your leg trying to land on the target is not on. Again, you may need to consider a seven cell canopy.

Remember you are required to clear all spectators or any members of the public at a height of 50 feet as you approach the target (APF Op. Regs).

The Operational Regulations require you to have a ram-air canopy in your reserve container. The only exception is when you are permitted to use a round reserve for a particular display by the Council's Display Licence Examiner. Permission to use a round reserve is likely to be granted only in special cases, such as when the landing area is very large.

Licences

As a display jumper, you are required to hold a licence permitting you to jump into an area of the size of the landing area. **You must be a current member of the APF and you must hold a current Display Licence.** The Licensed Display Organiser should check this but it is your responsibility to have the correct licences, and you should be prepared to show the Licensed Display Organiser your documentation.

Briefing

A display jump is not just another jump. You will be jumping into an unfamiliar area, probably over a town, perhaps carrying a banner or flares, perhaps using a strange aircraft. You must ensure that you are thoroughly briefed on all aspects of the jump. This is the Licensed Display Organiser's responsibility. However, if the organiser does not fully brief you, it is your responsibility, and in your own interests, to ensure that you are fully familiar with all aspects of the jump. If in doubt, do not get into the aircraft!

Are you fully confident about:

- The location and size of the landing area and the hazards there?
- Setting your altimeter (or AAD) for this jump?
- Who is jumpmastering and spotting the aircraft and the exit height and exit order?
- Your aerial manoeuvres, in freefall and under canopy?
- Handling your special equipment such as flag or flares?
- Location of wind indicators at the landing areas, and the direction of the prevailing winds?
- Alternative landing areas should you have a bad spot or low opening?
- What to do after landing and your exit from the show ground?

Personal Presentation

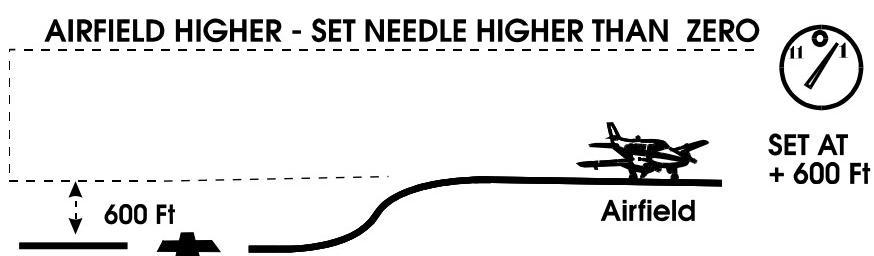
Display jumps are an important part of presenting parachuting as an acceptable activity in the eyes of the public. As a display jumper, you should be suitably attired. Scruffy jeans and tee-shirt are not acceptable for most displays. If your Display Organiser does not supply or specify a uniform, then either a track suit or your regular jump suit is probably the most appropriate dress.

Setting an altimeter at a location other than the DZ

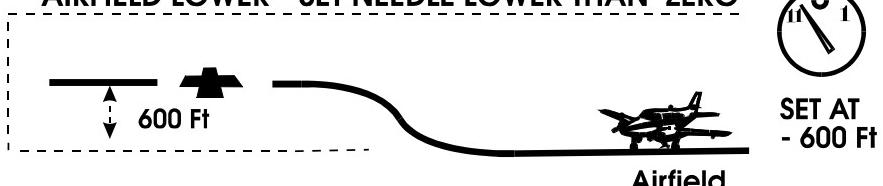
At times it is necessary to preset an altimeter when the airfield from which your aircraft will be taking off to do the display is at a different location to the drop zone and there is an altitude difference. If you cannot zero your altimeter at the DZ you may determine the altitude differential by studying an aeronautical chart. If you cannot determine the DZ altitude from the chart you can drive to the DZ any time before the jump, zero your altimeter there and then drive back to the emplaning airfield and note the reading. Your altimeter then reads as it should when you take off for the display.

Setting your altimeter correctly prior to take off is something you need to be sure about. It has happened that a team jumping into a DZ 500 feet higher have set their altimeters at 500 feet above zero on the airfield. This resulted in everyone opening 1000 feet below planned height.

Incorrectly setting an altimeter like this doubles the error!



AIRFIELD LOWER - SET NEEDLE LOWER THAN ZERO



AADs

AADs also need to be preset if the Drop Zone is at a different height from the airfield.

- **FXC 12000** AADs are set in the same way as altimeters since they display the set altitude AGL.
- **KAP3** AADs are set from sea-level so you need to know the height above sea-level of the Drop Zone.
- **Cypres** AADs are different again. The unit **must** be turned on at the airfield. On the fourth push hold down the button and after the self-test the unit will start showing 30 (foot) or 10 (metre) increments up and down (Δ & ∇) alternately. You need to know the height difference of the Drop Zone and when this appears the arrow needs to point to the DZ, either Δ if the DZ is above you, or ∇ if the DZ is below. See the Cypres User's Guide for more detailed instructions.

THE DISPLAY

Spotting and jumpmastering the load

This is probably one of the most important safety aspects of the display.

There are many more factors to consider than are usually present on a normal DZ load. Not only do you have the safety of the jumpers on the load to consider, you also have the added responsibility for the safety of the general public and show spectators.

If you are jumpmastering the load, some of the factors you should be considering and which should be discussed with the Licensed Display Organiser are:

- Is the exit point over a clear area and visible to the crowd ?
- Have you allowed for any high openings that may be planned ?
- Is there any other air traffic in the area ?
- Do you have to get a "clearance to drop" from Air Traffic Control ?
- Have you allowed for sufficient over-shoot and under-shoot areas ?
- Do you have a plan 'B' if you cannot get the desired height ?
- Will you need to "off set" the drifter spot to ensure the drifter does not land where it might constitute a hazard?
- Have you calculated the spot to allow for the minimum performance reserve on the load?
- Have you considered the meteorological report in relation to wind speed at various altitudes and does this agree with what the drifter tells you?
- Have you briefed the pilot ? If they are not an experienced jump pilot, this briefing will need to be fairly extensive.
- Will you be timing the drifter descent time ?

Note: When making your drifters ensure you do not use a hard object as a weight: it can become a dangerous projectile. Plasticine or rolled newspaper is ideal.

Jumpmastering a display load can be a difficult task; it can also be quite simple provided you are well prepared and practiced in what you are doing. Some jumpers will not have had much practice at throwing drifters and a display is not the place for a first try. Two drifters can be thrown on the first pass. These are best constructed in different, bright colours. Drifters should be multi-coloured: they can be easily lost against a suburban background and you will need to keep a careful eye on them. Make sure you tell the others on the load where they were thrown and where they landed - they will want to know. If you are not happy with the result of the drifter pass then have another go.

Above all do not be afraid to cancel the display if your judgement tells you to: don't be hassled by the team who may want to jump under any conditions - there can be a lot at stake.

Problems for individual jumpers

There are two main priorities when doing a parachute display:

- 1. SAVE YOUR LIFE**
- 2. LAND COMPETENTLY IN THE ARENA**

Every other consideration, whether RW or CRW, is of secondary importance.

Considering that you are an experienced parachutist you should have enough knowledge to save your life under most circumstances. This leaves arriving on target as the next priority. Good canopy handling is the difference between a good display jumper and a bad one.

A really tight display is going to require good canopy handling and well practiced techniques. There are a few basic rules that can be applied to most displays and there are also a few very basic errors that can cause an out-landing. Two of the most common are going too far downwind on a windy day and getting too hot on a low wind day.

Watch the lower jumpers

If you are not the lowest or first in then you can benefit by paying careful attention to the jumpers below you as they make their approaches. There is often a lot less wind in a stadium than outside and if the first jumper does get caught out then there is a lot less excuse for anyone following to do the same thing.

Too far downwind

The basic golden rule here is **not to get down wind of the landing area**.

Many pinpoint landings have been missed by taking a downwind leg over the top of the arena and turning into wind over the crowd only to find you are descending vertically and not penetrating into the wind. The technique of working on the upwind side of the target needs to be practiced. The best time for this is during normal drop zone jumping. You can set up just in front of the target and slightly off windline, edging backwards while side-slipping onto the windline. In winds of about 12 knots and above it is not a difficult technique. It does however need practice. If you should find that you have blown an approach and are over the heads of the crowd there can only be one thing to do: land outside the area clear of the crowd. A low hook turn and downwind landing is definitely not advisable nor is landing in a crowd.

Too hot

Again a basic golden rule is: **on low wind displays turn in low**.

This does not mean a low hook turn but a low turn in. It can be extremely uncomfortable to turn into wind at 200 feet over ring centre and find that you're on deep brakes and still creeping towards the upwind edge of the landing area or worse still the crowd. In light winds it is not always necessary to be exactly on wind line. You can consider making your final approach along the diagonal of the arena rather than straight across, giving yourself a longer line to land on. This technique is not considered a normal accuracy practice and may be shunned by competition accuracy jumpers. Again a low hook or a stall in this situation can be dangerous. The only way out is by careful canopy control. You will need to be confident in deep brakes and capable of getting in and out of sink

without losing control. Practice is the key. The classic competition accuracy techniques and principles do not always apply to display jumping but learning classic accuracy will go a long way towards helping you avoid this kind of error in setting up your approach.

Flying your canopy

The public wants to see parachutes flying and landing. Do not hang about up wind longer than is necessary: the public wants to see you. (But do not get caught out by coming back too far, too soon in high winds).

Gentle spirals are enough to please the crowd. There is no need for wild gyrations.

If you are not doing CRW, a follow-the-leader pattern is a crowd pleaser, with each jumper a little above and behind the previous one. Non-contact CRW can be a very attractive spectacle but you do need to practice this at your own DZ first.

High performance canopies

A display is not the time to be jumping a strange canopy and it is definitely not the time to find out just how much space you require to land in. This is especially important if you are just starting to jump a higher performance canopy. Very often tight display sites are fully surrounded which helps to block off any wind or produce rotors which can suddenly cause you to be travelling downwind on finals. Not a good situation if you are jumping a canopy which already has a forward speed of 25 - 30 knots. If you are going to fly a canopy of this sort, it will pay you to develop a technique for short landing.

Keep in mind too that going into a strange DZ will require that you plan your approach with more than usual care. It is a good idea to discuss your approach with other jumpers on the display and set up a landing pattern. In this way you can concentrate more on your own approach and landing and only have to monitor briefly the other jumpers to check that they are flying the agreed pattern.

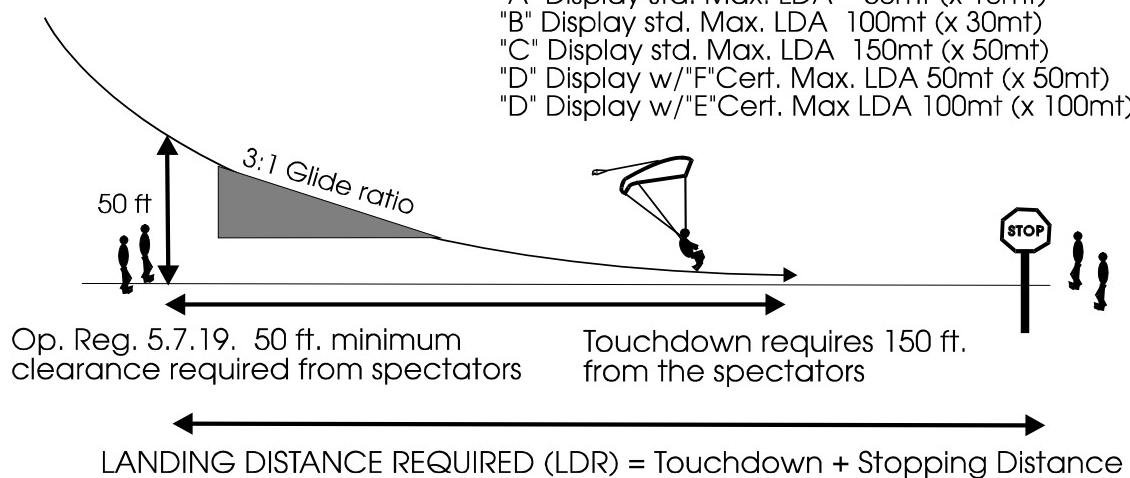
The diagram below refers to the landing distances remaining using the minimum distances and landing areas from the Operational Regulations and is a guide to the possible runway lengths you may require.

Your landing area

Be sure you can land in the available area!

Your licence allows you a minimum area to land in and the Op. Regs specify how close to the crowd you are allowed to land. This leaves a distance for you to land in. If you have any doubts about your ability to land in the space available then you should discuss it with the Display Organiser. If you want a particular runway direction kept clear then be sure you make this known to the TCO.

Landing Distances Available (LDA) using minimum display area



Turbulence

You should realise that turbulence can cause a canopy to collapse, stall or make an inadvertent side slip turn. Even high performance canopies with their higher inflation pressures can collapse in turbulence.

The air is more turbulent, and the turbulence extends further downwind when the wind is strong. This, not the lack of penetration or the backward landing, is the greatest cause of danger in strong winds.

You can encounter turbulence to some extent on almost every display jump. Buildings, trees and ground features cause it and there is no simple answer for handling it. You should try to get into the habit of looking for anything upwind of the landing area which may cause turbulence as this will give you an indication of when to expect to enter it. Your canopy may be less affected by turbulence when on quarter to half brakes. If you do have a canopy collapse then there is only one option, apply full brakes. Experience with your canopy is therefore essential.

Wind shear and rotors especially can also cause the display jumper problems and it is important to understand this form of turbulence. When a ram air canopy passes through a wind shear or rotor it changes suddenly from flying into wind to flying down wind, the canopy then surges forward attempting to pull the jumper with it. However, as less force is required for the canopy to rotate forward than to overcome the load's inertia, the canopy will usually rotate to a position level with the load (you) leaving you without support or control until you swing under the canopy. The canopy will usually surge forward less if brakes are applied before going through the wind shear.

Wind shear and rotors are likely to be found when descending below the roof of a grandstand or behind a tree line. They are generally caused when the direction or velocity of the wind is changed sometimes dramatically, when it hits an obstacle. There is little that can be done except to anticipate them and make the necessary allowances. Your ground smoke and wind drift indicators are useful tools when trying to anticipate either turbulence or wind shear. In a large stadium it can be very wise to have ground crew with smoke on the roof of the stadium in addition to smoke at ring centre.

Thermals

Again these can be encountered to varying degrees at almost any display. Although they are not usually a major problem, the lift generated by a hot grandstand roof or even a large crowd can give

you quite a bump. Anticipate them and make allowances. Competition accuracy approach practice will help you to learn how to handle the problem.

Orientation

If you have done most of your jumps on your own club DZ it can be surprisingly easy to get lost over an unfamiliar DZ especially in an inner city or suburban area. It is not uncommon to find you cannot locate the target area immediately on opening. The trick is to stay cool, go into deep brakes and make a systematic search of the area in quadrants. Watch where other jumpers are heading, this will give you an idea of where to look. The best way to avoid this problem is to be prepared: have a good idea of what the area looks like before you get into the aircraft and when you arrive over the top of the DZ have a good look around and locate suitable landmarks before you exit.

Traffic

Another common problem, especially with inexperienced display jumpers or badly organised display jumps, is the traffic jam on final approach. This can present an extremely dangerous situation especially when you have all your concentration centred on the target cross or perhaps an obstacle in close proximity.

It is quite common to feel that you do not have a traffic problem at 1500ft when there is plenty of airspace around you. The problems start on final when you have other canopies coming in at different angles and heading for the same target. The best way to avoid this situation is by carefully planning the display and including vertical separation and landing direction in your briefing. This is especially important if the breeze is light and variable.

For example if you have a very tight landing area it would be unwise to plan a single jump run at 2500ft with five jumpers. You would be better to plan two or three passes or alternatively exit higher and stack the opening heights. Knowledge of each person's descent rate under canopy should be used to plan the landing order.

If you do find you are on the same level as other jumpers then it may be necessary either to spiral or to front riser down. CRW can also present traffic problems; again anticipation and planning is the answer. You should also remember that a canopy formation has right of way over a single canopy.

Bad Spot

The best laid plans can go wrong and you will eventually find you have a bad spot. You may be able to salvage it if you recognise it in time. If you are constantly aware of your position, even in free fall, you will stand a better chance of not being caught out. It may be possible to track to a reasonable spot or vary your opening height if you see the error in time. If you find you are too long under canopy it may be possible to apply a little brakes on the downwind run to the target area. This may give you some extra canopy time allowing you to cover more distance than if you stay on full drive (this only works running downwind). If you are caught too far downwind, front risers may help you to get back.

Another problem is wandering or not remaining attentive to position. This can occur if all your attention is on building a CRW formation, or even spiralling. You need to remember that one of your main priorities is to land safely in the target area. If you cannot salvage the situation and an outlanding is inevitable (or even at all likely) then you had better start looking for a suitable safe outlanding area. Special attention will have to be given to powerlines and street traffic: if you can't see powerlines then assume they are along all roads and lead to all buildings and houses. Powerlines also cross roads.

Flags, smoke and special equipment

The use of any equipment, even different clothing, for display purposes that is not normally used during drop zone jumping can create a new set of problems. The golden rule is: **test every piece of equipment on the DZ first, not on the display.**

Rigging Advisory Circular No. 222 Rev B refers to "APF Design Standards for Flag Assemblies". This was produced following the 1994 APF Technical Conference which recommended that equipment used for the carriage and attachment of flags on a display shall:

- (i) comply with the design standard in this Rigging Advisory Circular,
- (ii) be approved by a Licensed Display Organiser,
- (iii) be used on two training jumps prior to a display, and
- (iv) be used in accordance with the APF Display Manual rules.

For the purpose of this standard a flag is defined as "a flag, banner, streamer or any similar equipment that has **a weight attached** and is carried by a parachutist and which may constitute a danger to the public".

If you are planning to build or carry a flag then you will need to refer to the RAC which is printed as Annex 'B' of this handbook.

Smoke can be very spectacular under canopy or in free fall. However it can also be dangerous. The carriage of pyrotechnic flares in some aircraft has been deemed illegal under the "Carriage of Dangerous Goods" Act. Pyrotechnic flares are those that produce smoke by heat and most flares fall into this category. These flares also require special means of attaching them. Cases of dropped flares have occurred and hot flares have been known to produce enough heat to burn through metal attachment brackets, wires or chains.

The safest flares are "cold smoke" or powder smoke trails. If you speak to some of the older display jumpers you can hear stories from the "bad old days" of jumpers being hospitalised with a foot badly burnt by a smoke flare. There has also been a fatality in Australia where a deployment bag became entangled with a foot mounted smoke bracket. Smoke can also present a very real danger to the pilot and the safe operation of the aircraft if the flare is ignited inside the aircraft during flight.

Most smoke flares are generally toxic and dangerous to anyone who may be in a position to breath the fumes. This applies to the parachutists, the TCO or even spectators. They can also present a very real danger if allowed to start a fire in dry grass, especially in rural areas. (Makes sure your ground crew has a metal bucket ready if this is a possibility).

Pyrotechnic night flares are also extremely dangerous and may be illegal for carriage in an aircraft. Most incidents with these types of flares have been caused by the flares being inadequately secured. These flares can also produce enough heat to burn through heavy wire, metal brackets and especially clothing and flesh. It also takes very little imagination to envisage the amount of damage a flare of this type could do if released or dropped over a populous area.

Cold flares are available and your regional Display Licence Examiner or Area Safety Officer should be able to put you in touch with a distributor of these items and also safe methods for using them.

What impresses the public

It is a well known fact that complex skydiving RW manoeuvres don't always impress non-jumpers as much as what are to us quite simple techniques. Sequential RW on a display is really a waste of time and the audience will not appreciate what is going on. On the other hand show organisers have been ecstatic with a simple triplane from 3000 ft landing right on the cross.

A high altitude exit is of very little value, unless you have a large aircraft and a lot of jumpers. What a crowd may really appreciate is a simple relative work display from a medium altitude. A simple star, built slowly allowing the spectators time to see each jumper dock and then perhaps opened into a line, can be very spectacular, or a star burst with smoke is always popular. Similarly, complex CRW formations are not always as spectacular as smaller ones built at a lower level. A large formation built high takes a long time and it can be difficult to hold crowd attention, it is also much more difficult to spot for larger, high loads. If you do exit high use a smoke trail from the aircraft and on at least one of the jumpers.

Anticipation and suspense is what the audience likes. So do not let your commentator get too specific about your intentions, this could backfire if you fail to build the planned stack or 10 way, but no matter what you choose to perform on the display, remember that the show is not for you, it is for the audience.

Soft, stand up landings are a must and the crowd will always cheer when such a landing is achieved. After you have exited and it is obvious to the ground crew that you have located the DZ, you may have them remove the target ♦ before you touch down. This is if you are not trying for precision landings because if you land off the target the crowd will believe you have failed and missed. As you land, let your canopy settle and turn and face the crowd. Do not turn your back, you are still on stage. Wave and point to the descending canopies, but do not become a spectator. Keep moving and smiling.

You should also remember that the display does not finish with all the jumpers landing. You should have a pre-arranged place for the jumpers to gather and leave the area waving and smiling. Alternatively you could continue the show by lining up and waving to the crowd. You can gain further mileage for our sport by giving a packing demonstration after the jump. Have the commentator announce the time and place for this.

Ground Control

A poorly equipped or briefed ground crew can ruin your display. If you are doing a lot of displays then it will simplify matters if you have a ground crew kit containing:

- Large target panels - the larger and more brightly coloured the better.
- Pegs to secure target panels on a windy day.
- Smoke or any other special equipment you plan to use.
- A portable DZ wind indicator (long stick with streamer attached).
- A radio for aircraft contact.
- Assorted items such as: spare money, minor first aid items, draw cords, rubber bands for packing, standard commentator's sheet, how to take up jumping pamphlets, plastic bag for rubbish and perhaps a loud hailer that could be used for crowd control.

The Operational Regulation require that the Target Control Officer (TCO) be at least the holder of an APF 'A' licence or a person authorised by a Display Licence Examiner. This requirement also implies

that no other persons should be in the target area, eg. the TCO's children. It is the TCO's job to ensure that the DZ is cleared and safe before giving the "clear to jump" signal.

Crowd control

A crowd of any size presents a special set of problems for the TCO. If the DZ is, for example, a football stadium then crowd control is simplified as the landing area will usually be fenced off from spectators. However if the display is onto a beach front Mardi Gras then there may be problems keeping the spectators clear of the designated landing area. A single TCO can hardly be expected to keep thousands of people back if there is no fencing. These problems should be discussed by the Licensed Display Organiser with the festival organisers and if necessary additional crowd control marshals should be appointed. These marshals should be wearing something that distinguishes them from spectators and indicates they have some sort of authority over the display.

You do not suddenly want to find after setting up for a final approach onto the target that your landing area has disappeared into a sea of upturned heads. A nasty situation especially when children are involved.

Ground to air signals

The TCO will also be in charge of the target panels which can serve the dual purpose of indicating the target centre and also be used to communicate signals to the aircraft. There are different methods of using these panels to signal the aircraft and the jumpers. To give you a couple of examples:

I Do not jump, land aircraft	T Do not jump yet, orbit aircraft	+ Clear to jump now
< strong wind, clear to jump now. < arrow points into the ground wind.	moderate wind, clear to jump now. < arrow points into the ground wind.	< light wind, clear to jump now. < arrow points into the ground wind.
Important – These are not all official APF ground to air signals. The point to remember about signals of this nature is that they must be predetermined and fully understood by both the jumpers and the TCO.		

Conclusion

This handbook is not meant to be an exhaustive "how to do it" manual. It has been written using extracts from various articles and in particular extracts from a British article "Additional Notes On Displays" by Ray Ellis.

Display jumps can be a most enjoyable part of skydiving.

Given that there has been plenty of planning and preparation and there is a responsible attitude to weather, display jumps can be conducted safely for both spectators and jumpers alike.

Experience is the name of the game and jumpers new to display jumps should not be shy in asking experienced display jumpers for their assistance and opinions. There are some very proficient, professional display jumpers in Australia, most of whom would be happy to pass on their knowledge. If you are unsure of who you can talk to for this sort of information ask at the APF office for names and contact details.

Your Area Safety Officer or Display Licence Examiner is also an ideal person to talk to regarding any aspects of display jumping and regional display requirements.

You should always remember as a display jumper performing for the public you are a representative of the Australian Parachute Federation and your fellow parachutists and you should behave accordingly. It will benefit the display and parachuting in general if you perform in a professional manner.

The future of parachuting as a sport relies heavily on our public image.

Annex 'A'
(Currently undergoing up-date)

Operational Regulations which apply to parachute displays

The following are extracts of the Operational Regulations which apply particularly to Display jumps. These may change from time to time and you will need to refer to a current copy of the Operational Regulations. Additional regulations apply to the Licensed Display Organiser.

Annex 'B'

Note the issue date. You may need to check that this is the current revision.



RIGGING ADVISORY CIRCULAR

Issue Date: 01 July 1995

RAC No. 222 Rev. B

SUBJECT: APF DESIGN STANDARD FOR FLAG ASSEMBLIES.

STATUS: MANDATORY

IDENTIFICATION: For the purpose of the standard a flag is defined as a flag, banner, streamer or any similar equipment that has a weight attached and is carried by a parachutist and which may constitute a danger to the public.

BACKGROUND: The 1994 APF Technical Conference included a workgroup dedicated to discussing the issue of flags and flares with particular relevance to what is acceptable and how the Federation should regulate their use. The APF Technical Conference recommended that equipment used for the carriage and attachment of flags on a display shall:

- (i) comply with the design standard in this Rigging Advisory Circular,
- (ii) be approved by a Display License Examiner or Rigger B,
- (iii) be used on 2 training jumps prior to a display, and
- (iv) used in accordance with the APF Display Manual rules.

APF DESIGN STANDARD: For the purpose of this standard equipment shall be classified by size and/or weight as follows: (should the equipment fall into 2 categories re. size/weight, it shall be classified in the larger)
Small shall mean up to 1000 sq.ft or 12kg total weight
Medium shall mean from 1001 to 2000 sq.ft or 30kg total weight
Large shall mean 2001 to 5000 sq.ft or 50kg total weight
Very large shall mean over 5000 sq.ft or over 65kg.

CONTAINER

The container shall be constructed to securely retain the flag and weight assembly to the parachutist during freefall and canopy deployment. Although the design may not need to cope with terminal velocity opening shock loads it is recommended the design should retain the contents without inadvertent release or failure at 8g's. (8g's being equivalent to a hard opening).

The container assembly shall be constructed such that the flag and weight is not able to slump in the container (ie a reasonably tight fit).

The container should be constructed from robust material. It is recommended 420 denier parapac or equivalent be used for small and medium size flag containers and 1000 denier cordura or equivalent for larger sizes.

The container for large and very large flags shall be fabricated with structural webbing sewn externally to surround the container. The webbing shall incorporate the anchor points for attaching the container to the harnesss and the closing mechanism.

Where the container is mounted on the front of the body the width of the container shall not inhibit access to the cutaway and reserve ripcord handles.

The opening and closing mechanism on all flag containers shall incorporate a safety catch so that it requires two actions to open. Small and medium flags may use velcro and press studs (or similar). Large and very large shall use a multiple pin and loop closure system (or equivalent) with an operating handle that is itself secured to prevent inadvertent release.

HARNESS

Small and medium flag assemblies may be attached to the parachutist with a loop on the container which passes over the head and a waist, or leg type straps to pass between the parachute container and parachutists body.

Large and very large flag assemblies shall use a separate harness worn under the parachute harness, or a tandem parachute harness. A tandem parachute harness and container is highly recommended as it has shoulder and side attachment points which are suitable for direct attachment of a flag container assembly. Where a Vector Tandem parachute is used the drogue attachment may be used as a flag anchorage point.

FLAG ATTACHMENT / RELEASE

Flag assemblies shall incorporate a means of releasing an unpacked flag in the event of an emergency. A hook knife shall be considered a suitable release for small and medium size flags. Larger flags shall incorporate a 3-ring release or equivalent release-under-load device. Where a 3-ring or similar is used the operating handle shall incorporate a safety catch so that it requires two actions to release.

To avoid an offset load, flags shall be configured so that they are suspended from a central point below the parachutist.

Where a Vector tandem parachute is used for the descent the drogue attachment point on the Vector harness may be used as a flag anchor point in place of a separate harness.

Annex 'C'

SAMPLE COMMENTATOR'S INFORMATION SHEET

If the commentator is inexperienced in the describing a parachute display they should be provided with an information sheet to aid their commentary. The sheet should be bold typed and double spaced to facilitate reading it, perhaps in ring centre.

The information should be brief, interesting and to the point. It should be written well enough to allow it to be read directly to the crowd if the commentator does not wish to fill in with their own comments. "Cue" information may also be given to the commentator, ie: jump run, exit & opening.

Selection of a suitable commentator is an important part of your display preparations. If you are to provide your own commentary you will require a person who is well spoken and presentable, remembering that they may also be considered part of your parachute display team. The person selected should have as much personal detail on the participants as possible and also a good background of general parachuting experience (not necessarily practical). They also need to have a prior knowledge of the alternative plan should there be weather problems etc. Additionally the commentator must be able to handle any situation that may arise in the course of the commentary. For example if there was a canopy malfunction it would be far better to explain the technical details of the problem to the spectators than to dramatise the situation. Well handled, this situation could leave the spectators feeling that the parachutists must be very professional and competent to have handled such a situation under the circumstances.

You should remember that the commentary can greatly affect the success of the entire presentation, and that a poor commentary may have an adverse effect on the public image of your team and our sport in general.

(sample commentary sheet)

THE SCATTERED ACES PARACHUTE DISPLAY TEAM

THE TEAM MEMBERS

DAVE BLUEY - (all black parachute) DAVE IS CAPTAIN OF THE SCATTERED ACES PARACHUTE DISPLAY TEAM. HE HAS MADE OVER 1000 JUMPS SINCE HE STARTED PARACHUTING IN THE SYDNEY AREA BACK IN 1985. HE IS 30 YEARS OLD AND WHEN HE IS NOT PARACHUTING HE WORKS AS A COMPUTER OPERATOR. YOU WILL RECOGNISE DAVE BY HIS DISTINCTIVE ALL BLACK PARACHUTE. HE SHOULD BE THE FIRST TO TOUCH DOWN AS HE LEADS THE REST OF THE TEAM INTO THE TARGET AREA.

SUSAN WRIGHT - (blue striped parachute) SUE IS 25 YEARS OLD AND IS A PRINTER BY TRADE. SHE HAS OVER 800 JUMPS, MOST OF WHICH SHE DID AT HER HOME DROP ZONE IN PERTH. ONE OF SUE'S MOST MEMORABLE EVENTS WAS WHEN SHE PARTICIPATED IN AN ATTEMPT TO BREAK THE RECORD FOR COMPLETING THE MOST PARACHUTE JUMPS IN ONE DAY. THE ATTEMPT FAILED ALTHOUGH SUE MANAGED TO DO 50 JUMPS, JUST 5 SHORT OF THE RECORD AT THE TIME. SUE WILL BE JUMPING THE PARACHUTE WITH THE BLUE STRIPES ON HER DISPLAY TODAY.

DICK RODGERS - (rainbow, butterfly parachute) 22 YEARS OLD & SINGLE , DICK IS THE YOUNGEST TEAM MEMBER AND HAS HIS OWN BUSINESS SKIPPERING YACHTS FOR OVERSEAS DELIVERIES. ALTHOUGH SPENDING A LOT OF TIME AT SEA HE HAS STILL MANAGED 900 JUMPS IN THE FOUR YEARS HE HAS BEEN JUMPING. DICK HAS ALSO BEEN SUCCESSFUL AT COMPETITION PARACHUTING. HE HAS TWICE BEEN SELECTED TO REPRESENT OUR COUNTRY ON THE AUSTRALIAN PARACHUTE TEAM IN COMPETITIONS OVERSEAS. DICK JUMPS THE PARACHUTE THAT HAS THE DISTINCTIVE "BUTTERFLY" ON ITS UNDERSIDE.

THE DISPLAY

TODAY THE SCATTERED ACES WILL BE GIVING A DISPLAY OF FREE FALL MANOEUVRES FOLLOWED BY A TEAM ACCURACY DISPLAY.

THE DROP AIRCRAFT WILL FIRST CIRCLE OVER HEAD AT APPROXIMATELY 2000 FEET ABOVE THE ARENA AND ON THE 2ND CIRCUIT A STREAMER WILL BE THROWN TO INDICATE THE WIND DIRECTION AND STRENGTH TO THE TEAM LEADER, WHO WILL THEN CALCULATE THE EXIT POINT FOR THE ACTUAL DROP.

THE AIRCRAFT WILL THEN CLIMB TO A HEIGHT OF 6000 FEET AT WHICH TIME IT WILL BEGIN ITS JUMP RUN OVER THE ARENA HEADING INTO THE WIND. YOU WILL KNOW THEY ARE ABOUT TO JUMP WHEN YOU SEE A POWDER SMOKE TRAIL COMING FROM THE AIRCRAFT. YOU SHOULD THEN HEAR THE AIRCRAFT CUT ITS ENGINE AS THE TEAM EXITS THE AIRCRAFT.

YOU WILL SEE THEM MANOEUVRE THEMSELVES WHILST FALLING AT SPEEDS OF UP TO 200 MPH. THE TEAM WILL BE PERFORMING A BOMB BURST WHICH MEANS THEY WILL "TRACK" AWAY FROM EACH OTHER FOR 15 SECONDS TO SHOW JUST HOW FAR YOU CAN TRAVEL AT THAT SPEED. AT 3000 FEET THEY WILL BEGIN TO OPEN THEIR PARACHUTES. THE LAST TO OPEN WILL BE DAVE, HIS PARACHUTE SHOULD BE OPEN AT 2500FT.

DAVE WILL LEAD THE TEAM INTO THE TARGET AREA AND HOPEFULLY ONTO THE ACTUAL TARGET CROSS IN RING CENTRE. HE WILL BE FOLLOWED BY DICK AND SUE. AFTER LANDING, THE TEAM WILL GATHER THEIR PARACHUTES AND BE PICKED UP BY THEIR RECOVERY VEHICLE WHICH WILL THEN DO ONE LAP OF THE ARENA.

IF ANY MEMBERS OF THE CROWD WOULD LIKE TO TALK TO THE TEAM OR WATCH THEM PACK THEIR PARACHUTES THE TEAM WILL GATHER AT THE REAR OF THE BIRD PAVILION.

THEIR NEXT DISPLAY WILL BE CONDUCTED AT 2.47 PM THIS AFTERNOON.

SOME POINTS OF INTEREST

PARACHUTES:

THEY ARE CALLED RAM AIR WINGS. THIS IS BECAUSE THEY ARE INFLATED BY AIR BEING FORCED INTO THE FRONT OF THE CANOPY. THEY HAVE A FORWARD SPEED OF 25 MPH AND USE AERODYNAMICS SIMILAR TO THAT OF A HANG GLIDER. THE PARACHUTES ARE CONTROLLED BY STEERING LINES ATTACHED TO EITHER SIDE OF THE CANOPY. WHEN SKILFULLY CONTROLLED THEY PRODUCE A LANDING WITH THE SAME FORCE OF STEPPING OFF A CHAIR.

THE TARGET:

THIS IS THE CROSS AT RING CENTRE. NOT ONLY IS IT THE AIMING POINT FOR THE PARACHUTISTS, IT IS ALSO USED TO COMMUNICATE TO THE JUMP AIRCRAFT. THIS IS DONE BY THE TARGET CONTROL OFFICER WHO MAY MOVE THE PANELS INTO DIFFERENT CONFIGURATIONS. THIS CAN BE USED TO ABORT THE DROP OR PERHAPS JUST TO DELAY IT FOR SOME REASON.

FREEFALL:

THIS IS WHAT WE CALL THE FALL FROM WHEN THE PARACHUTISTS EXITS THE AIRCRAFT UNTIL THEY OPEN THEIR PARACHUTES. IT IS POSSIBLE TO REACH SPEEDS IN EXCESS OF 120 MPH DURING FREE FALL. ONCE THE PARACHUTES HAVE OPENED THE DECENT RATE SLOWS TO A PLEASANT 10 MPH.

AIRCRAFT:

THE AIRCRAFT BEING USED BY THE "SCATTERED ACES" IS A CESSNA. USED EVERY WEEKEND FOR SPORT PARACHUTING IT IS A SINGLE ENGINE, HIGH WING AIRCRAFT AND IS PILOTED BY JOHN SMITH WHO IS THE TEAM'S REGULAR PILOT HE IS ALSO A VERY EXPERIENCED PARACHUTIST WITH OVER 1400 JUMPS. YOU WILL NOTICE THAT AFTER THE PARACHUTISTS HAVE JUMPED THE AIRCRAFT WILL PROBABLY CIRCLE OVERHEAD UNTIL THE PILOT HAS CONFIRMED THAT THE JUMPERS ARE SAFELY ON THE GROUND. IT WILL THEN LEAVE THE AREA AND RETURN TO THE LOCAL AIRPORT.

ALTERNATIVE PLAN SHOULD THE WEATHER CONDITIONS BE ADVERSE

IF THE CLOUD IS TOO LOW IT MAY BE NECESSARY TO FORGO THE FREEFALL EXHIBITION AND DO THE TEAM ACCURACY ONLY. THE LOW CLOUD MAY MEAN THAT ALL THE PARACHUTES WILL HAVE TO BE OPENED AT THE SAME HEIGHT. THIS MAY ALTER THE LANDING ORDER INDICATED IN THE ABOVE PLAN.

Display Check List

Licence	Sporting licence in date	<input type="checkbox"/>
	Display licence in date	<input type="checkbox"/>
Parachute	Packed	<input type="checkbox"/>
	Reserve in date	<input type="checkbox"/>
Personal equipment	Altimeter	<input type="checkbox"/>
	Helmet, jumpsuit, gloves	<input type="checkbox"/>
	Pull-up cord, elastic bands	<input type="checkbox"/>
Special equipment	Flag, streamer, smoke	<input type="checkbox"/>
	Costume	<input type="checkbox"/>
	for TCO, target, smoke, WDI (give TCO my gear bag)	<input type="checkbox"/> <input type="checkbox"/>
Inspected site	Hazards, wind indicators, outs	<input type="checkbox"/>
	Can I get in safely?	<input type="checkbox"/>
Altitude adjustment	Altimeter	<input type="checkbox"/>
	AAD	<input type="checkbox"/>
Meeting place	Time, place	<input type="checkbox"/>
	How do I get back to my car?	<input type="checkbox"/>
Briefing, where am I supposed to be	in the plane?	<input type="checkbox"/>
	in freefall?	<input type="checkbox"/>
	under canopy?	<input type="checkbox"/>
	OK, I'm ready!	